duced by the formation of a crystal of ice being immediately eliminated by the mass of water below. In the interstices of the crystals there will be retained a weight of slightly concentrated sea-water at least as great as that of the ice crystals. These retain the brine in a meshwork of cells, and, as the thickness of the ice covering increases, and the freezing surface becomes more remote, the ice and the brine become more and more exposed to the atmospheric rigours of the Arctic winter. The brine will continue to deposit ice until its concentration is such that, for example, the cryohydrate of NaCl is ready to separate out. It probably will separate out until it comes in conflict with, for instance, the chloride of calcium or the chloride of magnesium, which will retain some of the water, without solidifying, even at the lowest temperatures. At the winter quarters of the *Vega* brine was observed oozing out of sea-water ice and liquid at a temperature of − 30° C. It was very rich in calcium and especially magnesium chlorides. In fact, *it is probably quite impossible by any cold occurring in nature to solidify sea-water.*

The residual and unfreezable brine which remains in considerable quantity liquid when sea-water is frozen, must also remain in greater or less quantity when fresh water is frozen. All natural waters, including rain-water, contain some foreign and usually saline ingredients. If we take chloride of sodium as the type of such ingredients, and suppose a water to contain a quantity of this salt equivalent to one part by weight of chlorine in a million parts of water, then we should have a solution containing 0·0001 per cent. of chlorine, and it would begin to freeze and to deposit pure ice at a temperature of −0°·0001 C.; and it would continue to do so until, say, 999,000 parts of water had been deposited as ice. There would then remain 1000 parts of residual water, which would retain the salt, and would contain, therefore, 0·1 per cent. of chlorine, and would not freeze until the temperature had fallen to −0°·1 C. This water would then deposit ice at temperatures becoming progressively lower, until, when 900 more parts of ice had been deposited, we should have 100 parts residual water, or brine as it might now be called, containing 1 per cent. of chlorine, and remaining liquid at temperatures above − 1°·0 C. When 90 more parts of ice had been deposited, we should have 10 parts of concentrated brine containing 10 per cent. of chlorine and remaining liquid at − 10° C. In the case imagined, we assume the saline contents to consist of NaCl only, and with further concentration the cryohydrate would no doubt separate out and the mass become really solid. On reversing the operations, that is, warming the ice just formed, we should, when the temperature had risen to − 10° C., have 999,990 parts ice and 10 brine containing 10 per cent. chlorine. Now, owing to the remarkable fact (which is dealt with at length in the second part of the paper) that pure ice, in contact with a saline solution, melts at a temperature which depends on the nature and the amount of the salt in the solution, and is identical with the temperature at which ice separates from a solution of the same composition on cooling, the brine liquefies more and more ice at progressively rising temperatures, until, as before, when the temperature of the mass has risen to −0°·1 C., it consists of 999,000 parts of ice and 1000 parts of liquid water, containing 1 part of chlorine. The remainder of the ice will melt at a temperature gradually rising from −0°·1 C. to 0° C.

The consideration of this example furnishes an easy explanation of the anomalous behaviour of ice, formed from anything but the very purest distilled water, in the neighbourhood of its melting-point. This subject has been studied with great care and thoroughness by Pettersson. The apparent expansion of all but the very purest ice, when cooled below 0° C., is ascribed by him in part to solid saline contents of the ice which exercise a disturbing and unexplained influence on its physical properties. Viewed in the light of the fact that the presence of even the smallest quantity of saline matter in solution prevents the formation of ice at 0° C. and promotes its liquefaction at temperatures below 0° C., we see that this apparent expansion of the ice on cooling is probably due to the fact that we are dealing not with homogeneous solid ice but with a mixture of ice and saline solution. As the temperature falls this solution deposits more and more ice and its volume increases. But the increase of volume is due to the formation of ice out of water and not to the expansion of a crystalline solid already formed.

In Table III. are given the volumes occupied by the ice (with inclosed brine) formed by freezing 100,000 c.c. (at 0° C.) of a water containing chloride of sodium equivalent to 7 grammes chlorine in 1,000,000 cubic centimetres (at 0° C.).

TABLE III.—*Water containing 7 parts Cl in* 1,000,000.

Temp. ° C.	Water frozen. c.c.	Ice formed. c.c.	Brine remaining. c.c.	Ice and Brine. c.c.	Pettersson III. Vol. of ice at T. c.c.	Diff.
T	V_1	v_1	V_2	v_2	P	$P - v_2$
− 0·07	99000	107979	1000	108979	108980	1
− 0·10	99300	108306	700	109006	109007	1
− 0·15	99533	108561	467	109028	109038	10
− 0·20	99650	108687	350	109037	109048	11
− 0·40	99825	108879	175	109054	109057	3

The volume of the ice formed on freezing this water is compared with that observed by Pettersson in freezing a sample of the distilled water in ordinary use in the laboratory.

It will be seen that the volumes observed by Pettersson agree very closely with those calculated for a water containing 7 parts of chlorine in a million.

The irregularities in the melting-points of bodies like acetic acid, to which Pettersson refers, are without doubt due to a perfectly similar cause.

Also the very low latent heat observed by Pettersson for sea-water is to be explained by the fact that the salt retains a considerable proportion of the water in the liquid state even at temperatures many degrees below the freezing-point of distilled water.

The *plasticity* of ice and the motion of glaciers receive a simple and natural explanation when we see, as in Table III., that, if the water from which this ice is produced contains no more than 7 parts of chlorine per million, it will, in the process of thawing, when the temperature has risen to −0°·07 C., consist to the extent of 1 per cent of its mass of liquid brine or water. The water considered in Table III. is certainly not less free from foreign ingredients than rain or snow. It follows, therefore, that a glacier, in a climate where the temperature is for the greater part of the year above 0° C., must have a tendency to *flow*, owing to the power of saline solutions to deposit ice and to dissolve it at temperatures below 0° C.

(*To be continued.*)

NOTES

THE Endowed Schools Committee, of which Sir Lyon Playfair is Chairman, after sitting for a year and a half, have agreed to their Report. This is not yet issued, but it is known that the Committee have reported in favour of endowed schools being in future largely used for the promotion of scientific and technical education. The Report also recommends that local authorities should be authorised to employ local rates for founding or contributing to laboratories and workshops in such schools in order to promote practical scientific education.

LAST week an important Conference was held at Oxford for the consideration of questions connected with the University Extension Scheme. The meetings were attended by many members of the University, local delegates, and others interested in this method of University development. There can be no doubt whatever as to the good work done by University Extension lecturers. Unfortunately, however, it is hard to obtain the funds which are necessary for the complete success of the experiment. One speaker urged that "the University should lead the way by the creation of a Jubilee Fund, and so stimulate local efforts." To this Prof. Rogers replied that the University was "positively poor." Prof. Rogers added that the result of an appeal to London Companies "had not been favourable," but that the Charity Commissioners might perhaps be willing to do something for the movement.

THE American Exhibition to be opened in the Earl's Court neighbourhood on May 9 will contain much that ought to be of scientific interest. The large encampment of American Indians will be found to contain a great variety of types, and ought to prove attractive to ethnologists. The machinery department will contain many illustrations of the successful applications of science, especially in the section directed to machines for the production and application of electricity. Under mining and metallurgy there will be a large collection of minerals, ores, and stones, besides specimens of metallurgical products. In the department of education and science will be found illustrations of the varied educational appliances and apparatus used in the United States, exhibits from the many institutions and organisations which exist in the States, and a very varied collection of scientific and philosophical instruments.

A NEW scientific journal—*Centralblatt für Physiologie*—has made its appearance this month in Germany. It is edited by Dr. S. Exner, of Vienna, and Dr. J. Gad, of Berlin, who have the advantage of the co-operation of the Berlin Physiological Society. The journal will be issued once a fortnight.

A MONUMENT to Galileo has been erected in Rome, on the Via Pincio, fronting the old Medici Palace, now occupied by the French Embassy, where he was kept a prisoner, in 1637, during his prosecution by the Inquisition. The monument consists of a column with a pedestal, on which is the following inscription in the Italian language:—"Erected in memory of Galileo Galilei, who was kept a prisoner in this Palace, for having seen that the earth moves round the sun."

DR. R. MÜLLER publishes, in the April number of *Mittheilungen aus dem Gebiete des Seewesens*, the results of an investigation as to whether or not the popular idea of equinoctial gales, the existence of which was contested some time ago as regards this country by Mr. Scott (NATURE, vol. xxx. p. 353), holds good for the Adriatic Sea. For this purpose the hourly records of the anemometer at Pola, from 1876-86, were used. During this period strong winds or gales were registered on 607 days, 63 per cent. of which occurred in the winter season (October to March). The months with least wind were naturally June and July; then a tolerably regular increase in the number of days with stormy winds took place till the end of January. A considerable decrease occurred in February, while March had the greatest number of stormy days. The result arrived at is that, for the Adriatic, no important influence can be attributed to the equinoctial seasons, especially during the autumnal equinox. Dr. Müller also quotes a similar investigation made by the *Deutsche Seewarte*, for the years 1878-83, for the German coasts, with nearly similar results; the percentage of storms for the winter season being 80 per cent., and for the summer season only 20 per cent. The greatest number of storms occurred in November and December, March having 14 per cent., and September 3 per cent. only.

AT a recent meeting of the Italian Meteorological Society, reported in its *Bollettino mensuale* for February last, the Committee enumerated the meteorological stations lately established by it abroad, viz. one in Tripoli, two in the Argentine Republic, three in Uruguay, one in Colombia (South America), and one in Mexico, and notified their intention of shortly establishing others on the Patagonian coasts of the Pacific and in some of the islands near Cape Horn. Among other matters discussed was the proposed suppression of the *Bollettino decadico*—which has reached its fourteenth yearly volume, and which contains the observations made at ordinary stations, and at stations in the Alps and Apennines, for decades—as the increasing work of the Society renders its publication difficult. The monthly means of these observations appear in the *Bollettino mensuale*, but the last published are for March 1886.

ON the night of April 12, at about 11.30, a brilliant meteor was seen in Værdalen, in Norway. It appeared in the east, and went in a southerly direction. At first the colour was a pure white, but during the progress of the meteor it changed into green and yellow. The lustre of the body was very bright, and its greatest apparent size was about that of an ordinary plate. On the meteor disappearing from view behind a mountain ridge, a sudden brilliancy seemed to indicate that it had burst into fragments, but no detonation was heard. It left a faint trail of smoke behind, about a few yards in length, which remained for a few seconds in the sky, then disappeared.

ON April 13 a shock of earthquake was felt at Lisbon, and in Malta and Sicily. Considerable alarm was caused in Jersey at a few minutes past 3 o'clock on the morning of April 21 by a slight shock of earthquake, the direction of which was from south-west to north-west. There was so loud a noise that at first some persons fancied guns were being fired. About the same time a smart shock of earthquake was experienced in Guernsey. A decided tremor of the earth, lasting about three seconds, and accompanied by a rumbling noise, was felt in all parts of the island.

THE death is announced of Dr. Nathaniel Lieberkühn, Professor of Anatomy at the University of Marburg, on April 14, at the age of sixty-five; and of Herr J. B. Obernetter, well known by his researches in photographic chemistry, on April 13, at the age of forty-seven.

A NEW GUINEA Exhibition will shortly be opened at Bremen.

MESSRS. R. FRIEDLÄNDER AND SON, of Berlin, send us the first quarterly list for 1887 of their new publications. It includes many valuable works in natural history and the exact sciences.

THE scheme for the formation of a North Sea Fisheries Institute is still under the consideration of the National Fish-Culture Association and of various local authorities, by whom efforts are being made to secure the necessary funds. It is proposed to form a Fish-Culture Station at Cleethorpes, and schools at Grimsby, and to carry out scientific observations wherever the conditions seem to be most favourable. Particular attention is to be given to the culture of the oyster and cod. A meeting has lately been held in London to advance the undertaking, and another is to take place shortly at Grimsby for the same purpose.

THE list of elements whose atomic weights have been determined with great accuracy has just received two valuable additions, for although one of them, silicon, is by no means rare in its occurrence in nature, and the other, gold, is neither among the most recently discovered of metals nor rare from the chemist's point of view, yet past determinations of the atomic weights of these important elements have resulted in leaving the subject enshrouded with considerable ambiguity. Prof. Thorpe and Mr. J. W. Young, who have recently determined the atomic weight of silicon, used for this purpose the tetrabromide $SiBr_4$, and, instead of the small quantities of material used by other experimenters, prepared upwards of half a kilogramme of this substance by passing bromine vapour over a heated mixture of pure silicon dioxide and charcoal. The product was rectified in an atmosphere of nitrogen, and portions for analysis were collected in bulbs without exposure to air; these bulbs were then broken in bottles containing pure water, and in each case the resulting turbid liquid was very slowly evaporated to complete dryness, the relation of the weight of silicon dioxide obtained to that of the tetrabromide used forming the basis of the calculations. The result of this long and difficult series of analyses fixes the atomic weight of silicon as 28·332. The instability of the salts of gold has long been a stumbling-block in the way of obtaining accurate determinations of its atomic weight, but Prof. Thorpe and Mr. A. P. Laurie have overcome this difficulty by utilising the double bromide of gold and potassium, which they prepared by digesting together pure gold. bromine, potassium bromide, and water, the salt being afterwards subjected to several recrystallisations. An unknown quantity of the pure salt was then carefully ignited, and the mixture thus obtained, of potassium bromide and gold, weighed; after removal of the potassium bromide by washing, the weight of residual gold obtained in each analysis furnished data from which one set of values averaging 196·876 was obtained. The bromine in the potassium bromide as determined by titration with silver nitrate gave a second averaging 196·837, and the weight of silver bromide formed yielded a third series of numbers, averaging 196·842. Taking Stas's value for oxygen at 15·96 the atomic weight of gold is fixed by these analyses at 196·85; but if, along with Mendelejeff, we consider oxygen 16, then gold becomes 197·28, and it is interesting to note that Mendelejeff considered the old value, 196·2, to be too low, there being no place in the periodic system for an element of this atomic weight having the properties of gold. Hence the result of the present determination has been to place gold in its proper position in the periodic classification. Prof. Krüss has just published (*Ber. Deut. Chem. Ges.* No. 2, 1887) the results of a determination of the atomic weight of gold recently made by him, according to which the probable value is 196·64. The method employed, however, was slightly different from the above, a weighed quantity of the double bromide itself being used as the basis of a portion of the analyses.

IN a paper on Electric Locomotion, read before the Society of Arts on the 20th inst., Mr. Reckenzaun pointed out that in the United States and on the European continent there are dozens of electric tramways at work to the satisfaction of everybody, while we have few opportunities of testing their advantages in England. Yet England is "the home of the dynamo-machine, the country where the electromotor has found its highest development." We have been outstripped in this matter chiefly because an Act of Parliament must be obtained before electric cars can be run, and every company has to apply for it separately.

THE other day M. Émile Rivière discovered a prehistoric station in the wood of Chaville, to the right of the Versailles road, in a part where there are comparatively few trees. Some flint implements and weapons were found, and a fragment of coarse pottery without ornament.

AT the February meeting of the Pekin Oriental Society, Mr. Owen read a paper on animal worship amongst the Chinese. He referred at considerable length to the worship paid to the fox, weasel, hedgehog, and snake, to which at Tientsin is added the rat. The first four are called the immortals. These deified animals seem to usurp the entire attention of the people, even to the exclusion of the Buddhist and Taoist gods. Dr. Edkins quoted from the Chinese to prove that animal worship was unknown in ancient times, while Dr. Dudgeon pointed out that it was a mistake to suppose that animal worship was confined to the four animals mentioned. The horse, cow, dog, insects, dragon, lion, &c., are worshipped. In the fifth month the centipede, lizard, scorpion, frog, and snake—the five poisonous animals, as they are called—are also objects of worship. Dr. Martin disputed Dr. Edkin's theory that animal worship was unknown in ancient times because it was not mentioned by Confucius; he (Dr. Martin) believed that it existed to a much greater extent in ancient than in modern times. From the observations of other speakers it is clear that animal worship occupies a very large place in Chinese superstitious observances.

THERE was an interesting Geographical Exhibition in connexion with the meeting of the Deutsche Geographentag at Carlsruhe on the 13th inst. An historical department showed the development of cartography, all the exhibits being from Baden and Würtemberg. Water-colour sketches by the well-known African traveller Paul Reichard, and some fine oil sketches by the painter Hellgreve, who was sent to East Africa by the Artists' Club at Berlin, were exhibited. In the plant department were shown cotton plants found growing wild in Togo land, wild coffee and sugar-cane from Cameroons, and tobacco and various seeds from the gardens of the German East African Society.

AN interesting case of "colour-hearing" was recently reported to a meeting of the Societé de Psychologie Physiologique. In this case, colour hearing was an hereditary peculiarity, transmitted from father to daughter.

THE third volume of the "Grande Encyclopédie" has just been published It is expected that thirty volumes will probably be required to complete this great work. Each volume consists of 1200 quarto pages in two columns, printed in small type.

EVERYONE who takes an interest in zoology is probably acquainted with the "Zoological Record," which consists of an annual volume containing a summary of the work done in the various branches of zoology. It was begun in 1865, and for the first six years was published by Mr. Van Voorst. For the last sixteen years it has been carried on by an Association of zoologists called the "Zoological Record" Association, who have received assistance in the shape of grants from the Government Fund of the Royal Society, the British Association, and the Zoological Society of London. The "Zoological Record" Association, having been lately unsuccessful in obtaining the continuance of some of these grants, and being unwilling to carry on the publication of the "Record" any longer, have agreed, upon certain conditions, to transfer their whole stock to the Zoological Society of London, who, for the future, have determined to carry on this most useful publication. The "Zoological Record" will, therefore, beginning with the volume for the present year (which will contain the record of the zoological literature of 1886), be published by the Zoological Society of London, under the management of a Committee of the Council of that Society, and will be edited by Mr. F. E. Beddard, the Society's Prosector. The "Record" will be published for the Society by Messrs. Gurney and Jackson at the former price of 30*s*. per volume. But all members of the Society will have the privilege of receiving it, including the cost of delivery, at a subscription price of 20*s*. per annum. This subscription will be due on July 1 in every year, and the privilege of subscription will be forfeited unless the amount be paid before December 1 following. The Zoological Society, having purchased the entire stock of the "Zoological Record," are now able to supply complete sets of the first twenty-two volumes at the price of 5*l*. 10*s*., that is 5*s*. per volume. Volumes of any single year can likewise be supplied at 10*s*. per volume. Learned Societies and Institutions and members of the former "Zoological Record" Association will be permitted to subscribe to the "Record" on the same conditions as are accorded to members of the Zoological Society.

It is intended to form a class, including beginners and advanced students, this summer, in the same way as last year, for the study of geology near London, to be conducted on Saturday afternoons, by Prof. H. G. Seeley, F.R.S., King's College. Applications for tickets should be made at once to the Hon. Secretary, W. W. R. May, 16 Bethune Road, Manor Road, Stoke Newington, N.

THE additions to the Zoological Society's Gardens during the past week include two Rhesus Monkeys (*Macacus rhesus* ♂ ♀) from India, presented by Mr. W. F. Lock; a Common Fox (*Canis vulpes* ♂) British, presented by Mr. Isaac Bell, Jun.; a Bosch-bok (*Tragelaphus sylvaticus* ♂) from South Africa, presented by Capt. Travers; a Vulpine Phalanger (*Phalangista vulpina* ♂) from Australia, presented; two Turkey Vultures (*Cathartes aura*) from the Falkland Islands, presented by Mr. James H. Moore; a Common Viper (*Vipera berus*), British, presented by Mr. S. E. Gunn; a Chinese Lark (*Melanocorypha mongolica*) from China; two Common Rheas (*Rhea americana* ♂ ♀) from the Argentine Republic, received in exchange; a Burrhel Wild Sheep (*Ovis burrhel*); two White-backed Pigeons (*Columba leuconota*) from the Himalayas; a Hodgson's Partridge (*Perdix hodgsoniæ*) from Bootan, purchased; four Long-fronted Gerbilles (*Gerbillus longifrons*), born in the Gardens.

OUR ASTRONOMICAL COLUMN

BARNARD'S FIRST AND SECOND COMETS 1887.—Comet *c* 1887, discovered by Mr. Barnard on January 23, has now attained a high declination, and, though faint, may possibly be observed within the next few days. Dr. H. Kreutz gives the following ephemeris for it for Berlin midnight, derived from Dr. H. Oppenheim's elements:—

1887	R.A. h. m. s.	Decl. ° ′	log Δ	log *r*
April 27	1 12 46	65 40·4	0·4742	0·3989
29	1 21 49	65 52·7		
May 1	1 30 47	66 3·8	0·4827	0·4057
3	1 39 38	66 13·7		
5	1 48 22	66 22·5	0·4910	0·4125

Correction of ephemeris for April 15, in R.A. + 3m. 46s.; in Decl. *nil*.

The second comet discovered by Mr. Barnard, viz. Comet *d* 1887, discovered February 16, is scarcely likely to be seen further. Its present brightness is but one-seventh of that which it had on March 11, and having almost exactly the same R.A. as the sun it scarcely frees itself from the twilight. An ephemeris for its course throughout the month of April, based on Dr. Palisa's elements, was given by Dr. Kreutz in the *Astronomische Nachrichten*, No. 2777, and in the *Observatory* for April; but the probability of its being observed after the April full moon had passed away, except with very powerful instruments, was very slight.

PROBABLE RE-DISCOVERY OF HESPERIA.—Dr. R. Luther detected a minor planet on April 11 which it appears probable is no other than the lost Hesperia, No. 69, as the magnitude and motion resembled those of the missing asteroid. Dr. Luther had previously looked for the planet in vain in 1882, 1885, and in March of the present year.

THE ELLIPTICITY OF URANUS.—Prof. W. Valentiner, of the Karlsruhe Observatory, writing in the *Astronomische Nachrichten*, No. 2781, states that Herr von Rebeur, observing Uranus with the 6-inch refractor of the Observatory on the evening of April 3, noticed that the disk appeared distinctly elliptical. On the following evening Prof. Valentiner himself observed the planet, and found that the direction as estimated of the major axis of the disk, the ellipticity of which was unmistakable, agreed closely with that of the assumed equatorial diameter as read off from the position-circle of the micrometer. Prof. Valentiner brings the subject forward now in the hope that those astronomers who have the command of powerful telescopes may be induced to give some attention to it.

THE WASHINGTON OBSERVATORY.—It appears from *Science*, vol. ix. No. 218, that the statement (reported in last week's NATURE, p. 595) that the sum of 400,000 dollars had been appropriated by Congress for the erection of a new Naval Observatory near Washington is erroneous. The amount actually available is but 100,000 dollars, with the understanding that the entire cost of the work shall not exceed 400,000 dollars.

THE PARIS CONFERENCE.—The same number of *Science* states that Ensign Winterhalter, of the United States Naval Observatory, had sailed for Paris, to represent the Observatory at the Photographic Conference. It is understood that Dr. Peters, of Clinton, and Mr. Rutherfurd, of New York, will also attend the Conference.

ASTRONOMICAL PHENOMENA FOR THE WEEK 1887 MAY 1–7

(FOR the reckoning of time the civil day, commencing at Greenwich mean midnight, counting the hours on to 24, is here employed.)

At Greenwich on May 1

Sun rises, 4h. 34m.; souths, 11h. 57m. 0·2s.; sets, 19h. 20m.; decl. on meridian, 15° 4′ N.: Sidereal Time at Sunset, 9h. 58m.

Moon (Full on May 7) rises, 11h. 27m.; souths, 18h. 59m.; sets, 2h. 19m.*; decl. on meridian, 14° 0′ N.

Planet	Rises h. m.	Souths h. m.	Sets h. m.	Decl. on meridian ° ′
Mercury	4 6	10 30	16 54	3 59 N.
Venus	5 58	14 21	22 44	24 16 N.
Mars	4 32	11 51	19 10	14 24 N.
Jupiter	18 1	23 14	4 27*	9 59 S.
Saturn	8 30	16 38	0 46*	22 21 N.

* Indicates that the setting is that of the following morning.

Occultations of Stars by the Moon (visible at Greenwich)

May	Star	Mag.	Disap. h. m.	Reap. h. m.	Corresponding angles from vertex to right for inverted image ° °
1	*o*′ Cancri	6	0 25	0 53	172 236
5	γ Virginis	2½	0 25	1 8	141 230
5	B.A.C. 4277	6	1 40	1 46	186 199
5	*l*² Virginis	5	21 30	near approach	323 —

May	h.	
1	15	Venus at least distance from the Sun.
6	8	Jupiter in conjunction with and 3° 14′ south of the Moon.

Saturn, May 1.—Outer major axis of outer ring = 39″·9; outer minor axis of outer ring = 16″·4; southern surface visible.

Variable Stars

Star	R.A. h. m.	Decl. ° ′		h. m.	
U Cephei	0 52·3	81 16 N.	May 4,	3 40	*m*
S Aurigæ	5 19·7	34 3 N.	,, 3,		*M*
R Canis Minoris	7 2·5	10 12 N.	,, 6,		*m*
R Camelopardalis	14 26·2	84 21 N.	,, 4,		*M*
δ Libræ	14 54·9	8 4 S.	,, 4,	20 11	*m*
U Coronæ	15 13·6	32 4 N.	,, 7,	22 7	*m*
S Herculis	16 46·8	15 8 N.	,, 3,		*m*
R Ophiuchi	17 1·3	15 57 S.	,, 2,		*M*
U Ophiuchi	17 10·8	1 20 N.	,, 4,	2 37	*m*
			and at intervals of	20 8	
W Sagittarii	17 57·8	29 35 S.	May 2,	22 0	*m*
			,, 6,	2 0	*M*
T Herculis	18 4·8	31 0 N.	,, 7,		*m*
U Sagittarii	18 25·2	19 12 S.	,, 2,	2 0	*m*
			,, 5,	1 0	*M*
β Lyræ	18 45·9	33 14 N.	,, 2,	22 0	*M*
			,, 6,	4 0	m_2
R Aquilæ	19 0·9	8 4 N.	,, 2,		*m*

M signifies maximum; *m* minimum; m_2 secondary minimum.